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5 System for controlling a remotely located video recording device
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1 **System for controlling a remotely located video recording device**

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5 This application is based on Provisional Application Serial Number 60/196,173
6 filed on April 11, 2000, titled "Internet Web-Based Operation of a Remotely Located
7 Video Recording Device"

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11 **BACKGROUND OF THE INVENTION**

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13 This invention relates generally to the field of digital communications, and more
14 particularly to a system for controlling operation of a remotely located video recording
15 device when there exists an Internet Server accessible via a Web-enabled device, and
16 a video recording device (VRD) of the type commonly referred to as a Digital Video
17 Recorder (DVR; also known as Personal Video Recorder), the VRD also being capable
18 of connection to the Internet.

19

20 This invention utilizes as its basis the advent of both the Internet (World Wide
21 Web or Web) and the Digital Video Recorder (DVR; also known as Personal Video
22 Recorder, or PVR). Prior to the advent of the Web and DVR, the use of common
23 programmable consumer devices was typically enabled via use of direct access to a
24 device control panel or, more recently, via use of a wireless handheld remote control
25 (typically using infrared signaling); In either case, the modification of the state of such

1 devices was always performed when in direct proximity to the device (i.e., in the same
2 room). A common example of such is the traditional Videotape Cassette Recorder
3 (VCR). Some other more recent advances in "remote control" of consumer devices
4 incorporate use of the telephone and the telephone "touch tone" signaling system - a
5 common one being the home telephone message recorder, many examples of which
6 may be accessed and controlled from a remote telephone. Other devices, such as
7 home lighting systems and heating systems, have also been made available with
8 telephone-based remote control features.

9 Commercial DVRs by design provide Internet-ready functionality used for access
10 to television program listings data, as well as operating software updates. The common
11 method a DVR uses to access the Internet is via a household telephone line that is the
12 same as a common voice line. DVRs, as designed, do not extend a user's operational
13 mode of the DVR interface beyond that of the common wireless remote control. Further,
14 though a DVR can connect to the Internet, the Internet does not inherently provide
15 extension of the operational mode of the DVR. Because there is inherent Internet
16 compatibility of commonly manufactured DVRs, and because there is a very large user
17 community for the general Internet, there appears both a technical and market
18 opportunity to enable closer integration of the two. Further, as a primary function of a
19 DVR is to enable recording of television programs when the user/owner of the DVR is
20 not home, it stands to reason that the more flexible and accessible the programming
21 features of a DVR are, the more useful it would become.

22 The invention claimed herein does extend the operational mode of the DVR by
23 making it controllable via an Internet/Web-enabled device. This is accomplished by
24 adding software to the DVR and providing software for an Internet Web Server.
25 Additionally, the invention is accomplished as stated above by harnessing the

1 interactivity of the Internet Web, as well as solving several communications problems
2 that result from designing a Web-based control environment for a remotely located
3 DVR.

4 Prior known inventions that may be related to the invention claimed herein are
5 disclosed in the following U.S. Patent numbers:

6 5,982,445 – which describes a method and apparatus for encoding HTML
7 resources within a Television broadcast system, and use of an HTML-type interface on
8 a television screen. This invention makes use of the Internet technology, but not the
9 Internet environment itself. This invention claims to provide interactive control of a
10 television or other household devices via an HTML interface. However, this invention
11 maintains the user control within the old paradigm of being in direct proximity to the
12 television device. In other words, it does not modify the user paradigm to extend it from
13 the “direct proximity” shortcoming, to the “remotely located” paradigm. Therefore, while
14 this invention applies some of the key Internet technology, it has a primary shortcoming
15 of limiting the mode of operation to the traditional one of being in direct proximity to the
16 end device.

17 5,963,264 – which describes a means of controlling a video recording device via
18 a television tuner which in turn is receiving commands for control of a video recording
19 device via a data stream provided by a television broadcast head-end system. Although
20 this provides a means of commanding a video recording device to record a specific
21 television program without the need to directly interact with the video recording device, it
22 does not solve the problem of enabling such a function without the need to be in direct
23 proximity to the device. That is, because the television apparatus must be controlled
24 using the traditional IR handheld controller (by definition in direct proximity to the device
25 with which it communicates) to in turn generate an IR saturation frequency to control the

1 video recording device (thus eliminating the need to use a handheld controller to control
2 the video recording device itself), the end user is not able to effect control of the video
3 recording device without being in its direct proximity.

4 5,990,884 – which in part addresses a means of communicating with a remotely
5 located device, such as a video recording device, over the Internet. However, there is a
6 full requirement that an intermediate device (referred to in the description of the
7 invention as an “Intelligent A/V Receiver”) be present and operational between the
8 device to be controlled (e.g., a video recording device) and the end user device (e.g., a
9 computer attached to the Internet). Further, the invention requires that the Intelligent
10 A/V Receiver not be embodied as an Internet Server, but rather as a device locally
11 resident to the devices to be controlled (e.g., a video recording device). Further, there
12 is a full requirement that all communication between the end user device (e.g. a
13 computer attached to the Internet) and the device to be controlled (e.g., a video
14 recording device) be managed in a “point to point” manner, thereby foregoing the use of
15 an Internet Server to act as the singular means of conveying and mediating information
16 to and from the end point devices (end user device and device to be controlled).
17 Further, there is no accounting for a means of enabling a plurality of end users wherein
18 each end user is authorized to control only a specific end device(s). Further, there is no
19 accounting for a means to store and convey at a later time, changes in state information
20 between a user account and an end point device; that is, all communication between an
21 end user device and a device to be controlled must occur in “real time”. Lastly, this
22 configuration demands that very specialized technology (apparatus and software) be
23 enabled in embodiment of the Intelligent A/V Receiver as well imbedded in the A/V
24 System objects (Video device, Audio device, etc.).

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3 SUMMARY OF THE INVENTION

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5 An object of the invention is to provide a system and method that uniquely
6 enables any human or system operator to control the functions of a remotely located
7 video recording device (VRD).

8 Another object of the invention is to enhance access to, usability of, and
9 usefulness of a VRD by eliminating the requirement that a user be in direct proximity to
10 the VRD for purposes of operational control.

11 A further object of the invention is to enhance access to, usability of, and
12 usefulness of a VRD by enabling storage of the VRD's State parameters in a database,
13 which is located remotely relative to the VRD. These State parameters include but are
14 not limited to currently recorded video programs, currently pending VRD commands,
15 new VRD commands that have not yet been transmitted to the VRD, prior recording
16 history, VRD memory storage utilization, and VRD television program lineup and
17 listings.

18 An additional object of the invention is to enhance usability of, and usefulness of
19 a VRD by enabling scheduled and unscheduled updates between a database of VRD
20 State parameters and a remotely located VRD by means of a network.

21 Yet another object of the invention is to provide television viewer demographic
22 statistics as a function of storage of each individual users' request to record a program.

23 Another object of the invention is to enable advertisers to target ads to specific
24 users based on demographic information of viewing habits.

1 In accordance with a preferred embodiment of the present invention, a system for
2 controlling operation of a remotely located video recording device comprises at least
3 one Video Recording Device (VRD) connected to the Internet; at least one internet
4 access device connected to the Internet; at least one Internet Remote Control Server
5 connected to the Internet which includes a database suitable for creating, storing and
6 retrieving VRD operational control and usage data for a VRD ("state" information), and
7 whereby the Internet access device can control the Video Recording Device.

8 Other objects and advantages of the present invention will become apparent
9 from the following descriptions, taken in connection with the accompanying drawings,
10 wherein, by way of illustration and example, embodiments of the present invention are
11 disclosed.

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14 **BRIEF DESCRIPTION OF THE DRAWINGS**

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16 The drawings constitute a part of this specification and include exemplary
17 embodiments to the invention, which may be embodied in various forms. It is to be
18 understood that in some instances various aspects of the invention may be shown
19 exaggerated or enlarged to facilitate an understanding of the invention.

20 FIGURE 1 shows one embodiment of the present invention as applied in the
21 operational environment defined herein; and

22 FIGURE 2 depicts another embodiment of the present invention as applied in the
23 operational environment defined herein; and

24 FIGURE 3 depicts another embodiment of the present invention as applied in the
25 operational environment defined herein; and

1 FIGURE 4 depicts a typical user's interaction with a typical embodiment including
2 the embodiment's interaction with a user's Video Recording Device.
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1 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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3 Detailed descriptions of the preferred embodiment are provided herein. It is to be
4 understood, however, that the present invention may be embodied in various forms.
5 Therefore, specific details disclosed herein are not to be interpreted as limiting, but
6 rather as a basis for the claims and as a representative basis for teaching one skilled in
7 the art to employ the present invention in virtually any appropriately detailed system,
8 structure or manner.

9 A. Terminology

10 1. Internet - is a term used to mean the most widely recognized interconnection
11 network deployed today. The Internet is a continuously changing coupling of networks
12 with many thousands of computers at its nodes, some computers acting as providers of
13 information, and some acting as requestors of information.

14 2. World Wide Web (or Web, WWW) - is a term used to mean the common method
15 for accessing and utilizing content (also called "resources") that is managed within the
16 Internet.

17 3. Web Site or Internet Web Site Host - is a term used to mean a type of host
18 computer on the Internet that provides content to WWW users.

19 4. Server or Host Server or Internet Server or Internet Remote Control Host Server
20 - is a term used to mean any Internet-based computer that manages content or other
21 data or information and has a means of brokering requests for information from other
22 Internet computers.

23 5. Television Listings - is a term used to mean a database of standardized format
24 that articulates the time and program to be broadcast in a region by a television

1 program provider. An example of a provider in the U.S.A. of Television Listings is
2 Tribune Media Services (TMS).

3 6. Video Recording Device (VRD) - is a term used to mean a device that, when
4 attached to a television signal provider, can be programmed to record a television
5 signal. For purposes of the invention claimed herein, additionally, a VRD is
6 characterized as having the inherent capability to connect to the Internet and
7 communicate with a Server. Commonly, though not a requisite for the invention claimed
8 herein, a feature of a Video Recording Device of the type pertinent to the invention
9 claimed herein, is that its means of storage is that of a common computer hard disk
10 rather than common videotape. The claims made herein would be applicable to any
11 such device, examples being those provided by the following companies: Microsoft
12 (UltimateTV), and TiVo, as well as manufacturers of products licensed by the preceding
13 companies, including Sony. Additionally, a Video Recording Device may also be
14 embodied by a personal computer that contains all the common personal computer
15 components as well as a television tuner card, software that simulates the functionality
16 of a VRD, and a method of connection to the Internet. For purposes of defining the
17 invention claimed here, the terms Personal Video Recorder (PVR) and Digital Video
18 Recorder (DVR) are synonymous with the term Video Recording Device (VRD).

19 7. Internet Web Access Device - is a term used to mean any machine that can
20 connect to the Internet and communicate with a Web Site via common HTML (Hypertext
21 Markup Language - the common language of the World Wide Web); common examples
22 being a personal computer, a handheld computer, or a cell phone.

23 B. Description of Drawings

24 Figure 1 depicts an operational environment of the invention claimed herein,
25 whereby a plurality of Internet Web Access Devices 13 are connected to the Internet 11

1 and communicate via standard HTML interfaces with the Internet Remote Control Host
2 Server 12. The Internet Web Access Devices may be, for example, a personal
3 computer, a handheld computer, or a cellular telephone. A plurality of Video Recording
4 Devices 10 is similarly connected to the Internet 11 and communicate with the Internet
5 Remote Control Host Server 12 through standard communications links such as
6 telephone lines, cable, fiber optic, or satellite.

7 The embodiment of the invention claimed herein is comprised of software that
8 resides on the Internet Remote Control Host Server 12 and software that resides on the
9 Video Recording Device 10. The implementation of the software module identified on
10 Internet Remote Control Host Server 12 may be accomplished using commercially
11 known development environments, one such example being Java Servlets and Java
12 Servlet Pages. The implementation of the software module identified on Video
13 Recording Device 10 may be accomplished using a development environment specific
14 to the implementation of the Video Recording Device 10, which may range from a
15 proprietary environment to an "open" environment such as a version of Microsoft
16 Windows. There is no limitation on the implementation and development environment
17 of the Video Recording Device 10; however, a singular, common implementation of the
18 software module identified on Video Recording Device 10 for all cases of VRD's 10 is
19 not probable.

20 Figure 1 shows that a Video Recording Device 10 may be operated from a
21 location other than that of direct proximity to a Video Recording Device 10 via any
22 instance of Web Access Devices 13. There is no practical limitation of the number of
23 Web Access Devices 13, nor the number of Video Recording Devices 10 that participate
24 in the processes described herein. The scalability of the invention has no limits below
25 those of the limits of the state-of-the-art of the Internet and Internet Sever technology.

1 Figure 2 depicts a standard configuration and use-case (example of a real-world
2 application) as follows:

3 The Internet Web Access Device 21 is operated by making a standard
4 connection to the Internet from anywhere in the world. The Internet Web Access Device
5 21 runs a standard HTML Web browser that is pointed to a URL for the Internet Web
6 Site Host 23, which may be any commercial Web Site, for example: "www.sony.com".
7 The Web Site Host 23 provides the Web Access Device browser 21 with HTML pages
8 that provide all the interface components required to operate the Video Recording
9 Device 20. These HTML pages are in effect a simulation of the Video Recording Device
10 20 on-screen interface, but not necessarily visually identical to each other. The
11 essential functions of the Video Recording Device 20 are presented in the HTML pages,
12 including, but not necessarily limited to: View Program Listings, View Programs
13 Scheduled for Recording, View Recorded Programs, Erase a Recorded Program, View
14 Minutes of Storage Available. The values for the functions listed in the previous
15 sentence are supplied by the Internet Remote Control Host Server 24, for example:
16 View Programs Scheduled for Recording = "Cheers, Saturday 10:00PM, Channel 12".
17 The values for View Program Listings are originated by the Television Listings Server
18 25, which is a 3rd-party commercial server that is not a component of the invention
19 claimed herein.

20 The Internet Remote Control Host Server 24 also provides information to the
21 Internet Web Access Device 21 browser pertaining to the "last known state" of the
22 remotely located Video Recording Device 20. This information enables the Internet
23 Web Access Device 21 to see settings that may have been changed by a user who is or
24 was in direct proximity to the Video Recording Device 20. This is accomplished by
25 enabling a set of user accounts on the Internet Remote Control Host Server 24, each

1 user account being a unique data set pertaining to a specific user and a specific Video
2 Recording Device 20. Every time a discreet change or set of changes (within the
3 context of a session) is made to the user account via the Internet Web Access Device
4 21 or to the Video Recording Device 20, a process is initiated to synchronize the user
5 account and Video Recording Device 20.

6 The following common cases depict the process for synchronization:

7 a. A change to the VRD settings in the user account is made via the Internet Web
8 Access Device 21 - in this case, a process is initiated by the Internet Remote Control
9 Host Server 24 to connect to the Video Recording Device 20 associated with the
10 specific user account and send the new settings to the Video Recording Device 20.

11 b. A change to the settings of the Video Recording Device 20 is made by a user in
12 direct proximity to the Video Recording Device 20 - in this case, a process is initiated by
13 the Video Recording Device 20 to connect the Video Recording Device 20 to the
14 Internet Remote Control Host Server 24 and send the new settings to the user account
15 associated with the specific Video Recording Device 20 on the Internet Remote Control
16 Host Server 24.

17 Figure 3 focuses on the essential components of the invention claimed herein,
18 namely, the software modules residing on a Video Recording Device 30 and an Internet
19 Remote Control Server 32.

20 The software module residing on Internet Remote Control Server 32 is comprised
21 of both executable code and a database. The code functions include methods of
22 serving Web pages, receiving HTML streams from a Web browser, interpreting streams,
23 reading and writing data to and from the database, creating and removing user
24 accounts, providing username and password-based secured login to user accounts,
25 communicating with other Internet Servers, and communicating with a Video Recording

1 Device 30. The database maintains all user account settings and values, and provides
2 a source for reporting on overall user groups' selections with respect to television
3 programs selected for recording (i.e., the unique program ratings feature that is fully
4 accurate and does not depend on statistical modeling). The database associates each
5 user account on 32 with a specific Video Recording Device 30, including all the
6 pertinent information regarding the Video Recording Device 30 for purposes of
7 electronically contacting and communicating with the Video Recording Device 30.

8 These two software modules (on Video Recording Device 30 and Internet
9 Remote Control Server 32) enable unique communication of state data between the two
10 objects 30 and 32:

11 a. whenever a change of state is made on a user account on Internet Remote
12 Control Server 32 in the context of a discreet session, a process on Internet Remote
13 Control Server 32 establishes communication with Video Recording Device 30 and
14 subsequently conveys the change from 32 to Video Recording Device 30.

15 b. whenever a change is made on a video recording device 30, a process on 30
16 establishes communication with Internet Remote Control Server 32 and subsequently
17 conveys the change from Video Recording Device 30 to Internet Remote Control Server
18 32.

19 c. whenever a change is made on either Video Recording Device 30 or Internet
20 Remote Control Server 32 and a subsequent conveying of said change from one object
21 to the other creates a conflict such that one change must be selected and kept, and the
22 other change rejected and deleted, rules encoded in the software modules in Video
23 Recording Device 30 and Internet Remote Control Server 32 shall resolve the conflict,
24 select one and only one change, and permute the change to both objects and discard
25 the unused change.

1 d. There are 2 distinct classes of modes of communication from 32 to Video

2 Recording Device 30 enabled by the invention claimed herein:

3 1) Mode 1 indicates that the Video Recording Device 30 will ping the Internet
4 Remote Control Host Server 32 on a timed interval basis and check for the presence of
5 changed state information. In this mode, Video Recording Device 30 initiates update
6 requests. An "update available" data bit flag is employed in the user account on 32 to
7 initially provide the update checking routine with the fundamental understanding as to
8 whether any changes have been made. Conversely, this mode may be deployed in the
9 opposite direction, wherein the Internet Remote Control Host Server 32 pings the Video
10 Recording Device 30. A further alternative implementation to this mode provides for a
11 ping of one object to the other whenever one object's settings have been modified; this
12 displaces the timed interval basis for checking for updates. All cases for this mode
13 require a direct IP persistent connection between Video Recording Device 30 and
14 Internet Remote Control Server 32.

15 2. Mode 2 indicates that an Internet Remote Control Host Server 32 process will
16 contact the Video Recording Device 30 by initiating a telephone call. This mode is used
17 when there is no direct IP connection between Video Recording Device 30 and Internet
18 Remote Control Server 32. In this case the user account database on 32 has the
19 telephone number associated with Video Recording Device 30. There are two options
20 for this mode: In the first option, the telephone line to which Video Recording Device 30
21 is connected does not have a Caller ID feature enabled. In this case, Internet Remote
22 Control Server 32 call the Video Recording Device 30 issuing a unique telephone
23 ringing sequence that VRD 30 recognizes as a call that can only come from Internet
24 Remote Control Server 32. This is a useful feature of the invention because it
25 eliminates the need for VRD 30 to be the only device attached to the telephone line (i.e.,

1 regular telephones and telephone answering machines may also be attached to the
2 line). A proposed unique ring sequence is: A single ring followed by brief pause (5 to 30
3 seconds), then a 2nd single ring followed by brief pause (5 to 30 seconds of silence),
4 then a 3rd ring within the following 30 second window. All other ring sequences are
5 ignored and not picked up by VRD 30 (i.e., VRD software assumes that such calls are
6 regular incoming voice calls). In the second option, the invention claimed herein will
7 function by having Internet Remote Control Server 32 call Video Recording Device 30
8 with a consistent set of outbound (from) telephone numbers (i.e., the numbers from
9 which Internet Remote Control Server 32 is calling); in this option, VRD 30 has been
10 pre-programmed with the outbound numbers, and the telephone line to which VRD 30 is
11 attached has an active Caller ID feature. The software on VRD 30 will then monitor the
12 Caller ID field between the 1st and 2nd rings. If the incoming number matches one of
13 the known Internet Remote Control Host Server 32 telephone numbers, VRD 30 will
14 pick up the line. Otherwise, the VRD 30 will ignore the call.

15 All updates to settings on either Internet Remote Control Server 32 or Video
16 Recording Device 30 are conveyed between Internet Remote Control Server 32 and
17 Video Recording Device 30 by a standardized record format that may be defined by the
18 implementation of the invention claimed herein, and not necessarily of any format
19 enforced by the invention; the software on Internet Remote Control Server 32 and Video
20 Recording Device 30 is able to parse and interpret the record format for purposes of
21 understanding what actions need to be taken and what data needs to be modified.
22 Additionally, there are “handshaking” and error routines. Each of the functions defined in
23 this paragraph would be readily understood, recognized as necessary, and could be
24 designed and implemented by any person skilled in the art.

1 Figure 4 consists of a sequence diagram, which depicts a User 41 having a Web-
2 enabled browser with Internet access, interacting with a Web Server 42, of a typical
3 implementation of the preferred embodiment. Figure 4 specifically depicts a use-case
4 associated with a Web user request to update the recording state of a remotely located
5 VRD. In the sequence of events, User 41 starts by requesting access to the system
6 from Web Server 42. Web Server 42 sends a username keyed request to Database 43
7 for the corresponding password. Database 43 returns the password to Web Server 42.
8 Web Server 42 compares the password returned from Database 43 with the password
9 sent by User 41. If the passwords match, then the sequence is allowed to continue;
10 otherwise an error code is returned. If the username and password are accepted, then
11 the main control web page is sent from the Web Server 42 to the Web browser of User
12 41. In this sequence diagram User 41 then requests a display of the current television
13 listings. Web Server 42 retrieves the television listings from Database 43. Web Server
14 42 sends the television listings as html code to the Web browser of User 41. User 41
15 then selects a television show that User 41 would like to record on VRD 45. The new
16 recording request is sent to Web Server 42, which in turn passes the request on to
17 Database 43 for storage in the user account.

18 At some later pre-scheduled time, or interactively depending upon the
19 implementation, Cron Server 44 contacts Video Recording Device 45 (the discreetly
20 identified VRD associated with the account of User 41 in Database 43) and requests
21 updated status data including current programming requests and currently stored video
22 programs. Video Recording Device 45 returns the requested data to Cron Server 44.
23 Cron Server 44 stores the retrieved data into the user account of Database 43. Cron
24 Server 44 then retrieves any new recording requests (or other command settings
25 changes) from Database 43 and passes them on to Video Recording Device 45, which

1 in turn updates the state of Video Recording Device 45 to reflect the change to the user
2 account of Database 43. (As mentioned prior, conflicts that arise per changes to user
3 account or VRD settings are resolved via rules logic encoded in the software of
4 Database 43 and VRD 45.)

5 **C. Results and Advantages**

6 An operator in any location in the world wherein there is an Internet Web-enabled
7 device may command a remotely located Video Recording Device to perform any
8 common VRD function.

9 As the use of this invention in commercial applications becomes greater, many
10 users will make requests to record television programs on their remotely located VRDs.
11 Each request may be recorded in a database, as noted above, and thereby over time, a
12 direct correlation between a user account and VRD, and a population of such pairings,
13 with specific television recording habits may be drawn. This result provides a unique
14 method of establishing television viewing preferences, the uniqueness of which, by
15 definition, does not depend on statistical sampling methods (the common method), but
16 rather, provides direct correlations between a user account and a request to record a
17 program. The commercial application of this data may be highly valuable to marketers
18 who wish to understand better what television programs are being viewed and by what
19 categories of viewers, in what percentages of a population.

20 While the invention has been described in connection with a preferred
21 embodiment, it is not intended to limit the scope of the invention to the particular form
22 set forth, but on the contrary, it is intended to cover such alternatives, modifications, and
23 equivalents as may be included within the spirit and scope of the invention as defined
24 by the appended claims.